

END POINTS MANAGEMENT

End Points Management

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The Need for End Point Specifications

The policy of the EM is that a formal project management approach be used for the planning, managing, and conducting of its projects. A fundamental premise of project management for facility deactivation is answering the question:

How do you know when the project is complete?

Just as the design specifications are essential to a construction project, specifying "end points" is the key to answering this question for a deactivation project. A requirement to specify end points (DOE O 430.1A, *LIFE CYCLE ASSET MANAGEMENT*, Section 6.g) is used to establish a facility's conditions when deactivation is complete.

Definition: End-State vs. End Points

End-state has been used to refer to the overall status and disposition of a facility after deactivation. End Points refer to the detailed specifications for the condition of spaces, systems, and equipment within a facility, and related documentation. Either way, the terms refer to conditions of a facility at the completion of the deactivation project.

Specifying and achieving end points is a systematic, engineering way of proceeding from an existing condition to a stated desired final set of conditions in which the facility is safe and can be economically monitored and maintained. An end point method is a way to translate broad mission statements to explicit goals that are readily understood by engineers and craft personnel who do the work. (It should be recognized that while end points as addressed here are for a final set of conditions for deactivation, they may represent an interim point for the overall EM cleanup goal.)

The end points concepts and ideas are not original. The end point methods described here build on original concepts and ideas of several individuals. The basic approach was created during the cleanup of the Three Mile Island Unit 2 where it was used to define the completion of the cleanup prior to long-term storage. That method was modified for application at the Uranium Trioxide (UO₃) and PUREX facilities at Hanford during 1994.

EM's end points specification methods were originally developed for deactivation project planning. They are equally applicable and usable for planning of stabilization and decommissioning projects.

Specific end points will vary from facility to facility. The method(s) by which facility-specific end points are defined should, however, be consistent. Therefore, this handbook does not (and cannot) attempt to define what end points should be. Rather, it provides methods by which each project's manager can derive their facility's end points based on objectives and principles common to all deactivation.

Compiling end point specifications for the entire facility has the following uses during and/or after implementation:

- As input for scheduling and estimating the project cost.
- To create detailed work plans for each space and system in the facility.
- To document bases for performance based contracting or out-sourcing of work, where practical to do so. In effect, to become part of the performance specifications.

- To demonstrate conformance to agreements negotiated with third parties who have a legitimate stake in the condition of the facility after deactivation.
- To show compliance with both local and federal regulations.

The Need for a Method to Derive End Points

The detailed specification and actual end points achieved will undoubtedly vary from facility to facility. Variations are expected because of the differences among facilities with respect to past missions, equipment and systems, containment, degree of contamination and ability to isolate the contamination, facility environs, projected ultimate disposition, if known, and a host of other factors. Regardless of variations in conditions achieved, the method used to decide and specify end points are fundamentally similar.

The methods described here can be readily adapted to a wide range of facilities; they are intended to expedite choosing how to proceed with end point planning and implementation. In some cases, the primary objective of a project may be to continue or in some cases initiate the "stabilization" of material or a facility, as contrasted with "deactivation." The basic approach in this handbook can be adapted to such projects. However, more front-end effort to define end points method matrices and checklists described here may be necessary.

For those facilities that will be, or are candidate for, transfer to an extended care or decommissioning organization, two important documents that should be used together with this handbook are DOE G 430.1-4, *DECOMMISSIONING IMPLEMENTATION GUIDE*, and the *Decommissioning Handbook* (DOE/EM-0383, January 1999).

Deactivation work can involve a wide range of tasks, such as removal of remaining hazardous material, elimination or shielding of radiation fields, partial decontamination to allow access for inspection, isolation of systems, installation of monitors and alarms, etc. It is important that the end point for each of these tasks be established clearly and in advance, for the following reasons:

- End Points must be such that the central element of the deactivation objective - to achieve a low risk-low cost condition - is unquestionably achieved.
- End Points are a means by which the deactivation and receiving organizations can achieve agreement on the conditions of transfer of facility management upon completion of deactivation.
- Much of the deactivation work involves worker exposure to radiation or dangerous materials. Avoiding unnecessary work can minimize this.
- Each task is, in effect, competing for resources with other deactivation tasks and other facilities. By assuring that each task is appropriately bounded, DOE's overall resources can be used most fully and effectively.
- An end point method is the mechanism to begin detailed planning, leading to a schedule and budget. It is strongly emphasized that this will help avoid excess contingency (conservatism) in establishing the deactivation project budget and schedule.
- Deactivation end points where possible should be in concert with, or at a minimum not preclude, longer-term disposition options.

End Points focus on explicitly measurable or identifiable objectives such as, but not limited to, configuration of systems and equipment, removal of materials, residual contamination levels, and preservation of records for future need.

An end point method leads to work orders to deactivate a facility and achieve stable conditions for radioactive or hazardous conditions and materials. A method must provide a consistent, systematic way of defining, planning, and executing work. It should represent a straightforward, common sense engineering approach, which can be readily carried out by workers.

The methods presented here have been evolved in the field and have worked well in the form presented. As such, they should work for any facility with appropriate adaptation to its characteristics.

Guiding Principles for Specifying End Points

There are several guiding principles (ground rules) that form the foundation of the end point process. They are:

- **Driven by Objectives** - The decision to specify an end point should be driven by, and clearly linked to, top-tier program objectives. This is the central principle of the logic-based approach. End Point determinations, along with

allocation of resources and selection of methods, should all stem directly and clearly from program goals and top-tier objectives.

- **Cost for Reduced Risk Achieved** - End Point decisions are integrally linked to decisions (and constraints) on resources and methods. Cost effectiveness is important. DOE needs to achieve maximum safety improvement (and optimum risk reduction) for every deactivation dollar spent.

That is, there is a point at which expending further resources to reduce risk will not achieve commensurate reduction in S&M costs. If a proposed end point is not economically feasible, it should only be specified if mandated by law.

- **Decoupling from Decommissioning Decisions** - In many cases, it is not known when or how the ultimate decommissioning will be done. Therefore, end point decisions *may consider* , but should not be driven by decommissioning presumptions.
- **Defense-in-Depth** - The end-state condition of the deactivated facility should employ defense-in-depth as a fundamental safety approach. As applied here, defense-in-depth involves three layers of protection: elimination or stabilization of hazards, effective facility containment, and facility monitoring and control. In this context, the concept of reducing risk to acceptable levels can be applied.
- **Need for Ownership** - Successful end point development requires "ownership" by all affected organizations including the planners, the deactivation work force, and the receiving organization (the "customer").
- **Need for Clarity** - Work teams in the field need clear, quantitative completion criteria. They can't work effectively with vague or functional objectives. To be workable, end points must be:

- established up front
- clear, quantitative
- practical and achievable

- **Need for Flexibility** - End Point development is an iterative process. Most end point decisions can be made during the planning stages early in the project, however, some will have to be revisited as deactivation proceeds.
- **Research to be Avoided** - A deactivation project is intended to be done in the short term. Therefore, it must be possible to achieve the objective with what is then known. That is, a reasonable schedule would probably not allow for primary research as a prerequisite for activities to achieve an end point. Similarly, development, where considered, should probably be limited to applying existing technology to the situation at hand unless very unusual conditions exist.

These guidelines should be used when selecting an end point method to use, setting up criteria, and specifying detailed end points.

Tailored Approach

Two methods for developing a project's end point specifications are the "**Hierarchical**" method, and the "**Checklist**" method. The hierarchical method is appropriate for a complex facility with process systems and/or substantial hazards. The checklist method is more appropriate for relatively simple buildings that are not very contaminated and do not have complex equipment or systems. Deactivation project managers should start with these as examples, choose one method appropriate to their project, and adapt what is in this handbook to their project. The following table lists some considerations for choosing one over the other.

Considerations for Choosing an End Point Method

Consideration	Favors the Hierarchical Method	Favors the Checklist Method
There is clear need for end points to be systematically derived and defensible.	X	
A long-term post-deactivation S&M period is anticipated.	X	
Facility is to be dismantled immediately after deactivation.		X
Facility is a single building or room.		X
Facility has many rooms, some of which are inaccessible or heavy contaminated.	X	
Facility has one or more complex process systems.	X	

Facility contains substantial radioactive or chemical hazards.	X	
Facility contains several RCRA units.	X	
There is no fixed radioactive contamination and it is relatively straightforward to remove all hazardous materials.		X
Facility has no radioactive or hazardous materials.		X
There is very little budget or resource for deactivation work.		X
Very little resources are available for end point coordination.		X

Headquarters, Field Office, and Contractor Roles

This describes the relative roles of the three primary organizations involved in deactivation end point decisions that have a *project-level focus*.

Clearly the defined lines of authority and responsibility flow from the government to the contractor. Once DOE direction has been established, the contractor proposes how to get there. Within this context, for efficient project management and expediting the path forward, an approach has worked well in which all three organizations participate essentially simultaneously in significant decisions. This is in lieu of a several step sequential process, with iterations at each step, in which each level of authority must agree before the next becomes involved.

Headquarters Role

Specifying detailed end points is predominantly a field activity. DOE Headquarters involvement is important early when decisions may substantially affect budgets, when a decision requires unique interaction with other DOE sites, or when a national or international policy or program might be affected. The DOE Headquarters program manager's participation in the development and approval of the project plan or project management plan indicates acceptance of the project baseline that is derived from the overall facility end-state decision. Such approval is also tantamount to approving the final configuration, which directly affects future budget requirements or general budget levels for future S&M.

Headquarters responsibilities specific to detailed end point specifications are to:

- Assist in deciding and achieving end points that require interaction at a national level.
- Stimulate experience transfer among the various sites regarding deactivation end points.

Field Office Role

DOE provides the programmatic direction for the overall end-state as a prelude to proceeding at the working level. The Field Office is responsible for determining what the facility's condition will be after deactivation. This is done in coordination with appropriate headquarters organizations that deal with budgets and national priorities.

The Field Offices' primary responsibility with respect to achieving detailed end points are then to ensure that the deactivation contractor is performing to a set of measurable objectives. The field office project manager should have approval authority over the project plan. This signature should indicate agreement with the level of planning and that the baseline can be achieved with the identified resources and within the baseline schedule.

In the course of deciding on implementing end points, there may be occasions when the field office will become involved in the more-routine aspects of achieving end points. Such involvement could include, for example:

- Concurring with the method proposed for end points and the top-level setup for applying the method.
- Resolving disputes between the deactivation contractor and the organization that will receive the facility for post-deactivation S&M.
- Providing an interface with stakeholders (including Federal and State regulators) where field office agreements are likely to result in requirements that will directly affect end point planning.
- Providing an interface for other field office support activities and functions.
- Providing an interface with Headquarters for resolving issues beyond the scope of the Field Office.

Deactivation Contractor Role

Within the larger responsibility of preparing a detailed project plan, specifying and achieving detailed end points rests with the facility deactivation contractor. In general, this is the maintenance and operations (M&O) or integrating contractor, but not necessarily in all cases. The contractor should:

- Define the method to be used for specifying end points.
- Conduct detailed end point planning, including coordination with the receiving organization.
- Incorporate this planning into the detailed project planning, including WBS, estimating, and scheduling.
- Create work plans as needed.
- Conduct the work.
- Obtain concurrence from the Field Office and the receiving organization at appropriate times in the process.

The end point method is consistent with the trend in DOE contracting which is towards performance based and fixed price contracting. Contractor's fee or incentive depends on achieving objectives at the least cost, consistent with safety. This approach, especially when fixed price contracts are involved, requires a basis for performance. End Points can be part of this basis. Micro-management is avoided by having the contractor take on responsibility for specifying end points which is then concurred with by the DOE.

End Points Approvals

Several documents will be created in the course of developing a facility's end points and the activities to achieve the specified conditions. The following table *suggests* the points within an organization for preparing and approving the documents as well as accepting the conditions achieved. (Job titles are typical - the job function is what is important here.) Each site and/or facility should create a similar table that addresses its specific contractual and administrative arrangements among its field office, deactivation contractor, and S&M contractor organizations.

Suggested Approvals

PROJECT FUNCTIONS	Document/Result						
	End-Point						
	Method and Setup	End-Points Completion Report	Preliminary S&M Plan	End Point Specifications	Work Packages	Closeout Method	Completed Work
Customer - DOE Field Office (Deactivation and Post-Deactivation)	A, F	A, F					F
Deactivation Project Manager (or Facility Director)	A	A	A	A		A	A
Engineering Manager		A	A	A	A		
Operations/Maintenance Manager				A	A	A	A
End Points Coordinator	P	P	P	P		P	
Facility Manager after deactivation		A	A				
Manager of post-deactivation S&M			P*	A		A	
System Engineers, Cognizant Engineers					P		A
Craft Foreman, Job Supervisors							S

* Primary responsibility. However, deactivation staffs that know the facility are important to, and should participate in, developing the S&M plan.

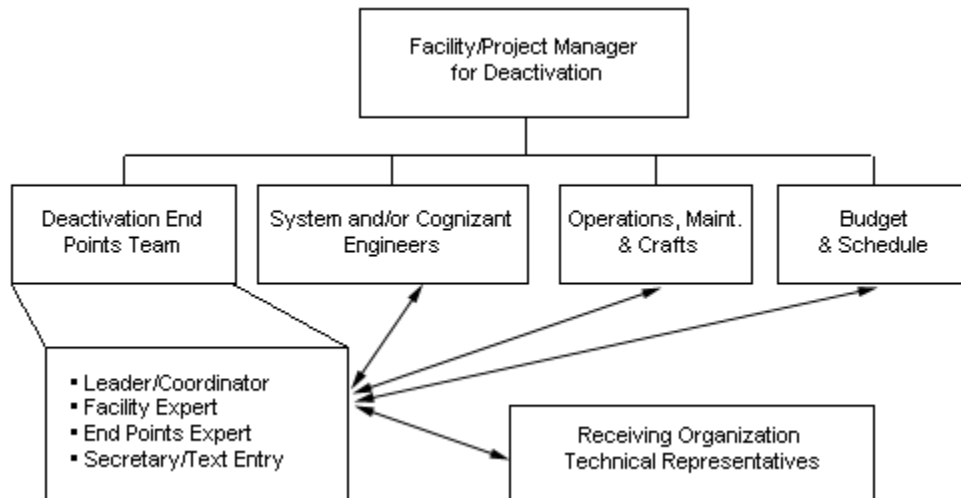
Legend:

A = Approves
P = Prepares

S = Signs for conduct of work
F = Final acceptance

Contractor Organization Functions for End Points Implementation

Creating an end points plan and coordinating its execution generally requires very little dedicated resources. For a complex facility, a three or four person group, the "Deactivation End Points Team" should be created to augment organization functions that already exist. This is shown in following figure. For non-complex facilities, this may require only one or two persons for part of their time.



Organization Interaction for End Points Implementation

Existing Organization Function

The existing facility organization functions and roles are:

- Facility Manager or Project Manager - Overall responsibility for deactivation, including end point planning, method to be used, and implementation.
- System and Cognizant Engineers - End Point tasks are an extension of normal responsibilities. Their knowledge of the facility equipment and spaces is essential to establishing specific end points. These engineers would also create the end point work plans.
- Operations, Maintenance, and Craft - Supervision and labor for accomplishing end point conditions.
- Budget and Schedule Preparation - End Points will drive the deactivation schedule and budget and thus there will be significant interaction with the end points team.

Other functions in the existing organization, such as health and safety, quality assurance, records management, purchasing, etc. will also be involved to the extent that implementation tasks are part of their normal jobs.

End Points Team

For deactivating a *complex* facility, an effective end points team, reporting to the Project Manager, should have the following staffing:

- Leader/Coordinator - a facility knowledgeable engineering manager with good technical, organizational, and administrative skills. Should report to the deactivation project manager.
- Facility Expert - an engineer or senior supervisor/technician who is intimately familiar with the equipment, physical layout, conditions, and materials in the facility. This person provides advice to the team and interaction with the facility technical and operating staff.
- End Points Expert - an engineer who will learn the concepts in this handbook and is assigned to work with system and/or cognizant engineers to specify the detailed end points. (No special engineering discipline is necessary as the end point approach is fundamental engineering.)
- Secretary/Text Entry - Clerical support for document creation and data entry.

The end points team should make use of a number of plant personnel in the process. The best knowledge available on each of the systems/components should be used as a resource, not necessarily with membership, but with good representation on the end points team.

The establishment of the end points should be closely associated with the project schedule and cost baseline planning and the same personnel should be used for both efforts. There should be a continuation of processes.

End Point Team functions and responsibilities can include:

- Selecting and recommending the end point method to be used.
- Setting up the end point method including objectives, task types, classes, functional matrices, and criteria, or creating the checklists (See **End Points Specification Methods**).
- Obtaining external input that will affect end point specifications, such as relevant stakeholder commitments, including Federal and State regulators.
- Creating a preliminary **Post-Deactivation S&M Plan**, including interaction with the receiving organization.
- Creating the end points document.
- Doing walk downs with system and cognizant engineers to specify detailed end points.
- Establishing End Point Work Plans - Creating the template for the work plans.
- Archiving End Point Work Plans - maintaining and ensuring proper archiving of the completed end point work plans. (See **Deactivation Completion and Turnover**)

Receiving Organization Technical Representatives

When there is a receiving organization identified, its manager should assign technical representatives to interact with end points planning and for developing the post-deactivation S&M plan. These representatives should participate directly in these developments, as opposed to being only reviewers.

Training and Walkdown Guidance for the Facility Engineers

System and cognizant engineers for the facility are instrumental in developing end point specifications because of their detailed knowledge of the facility. However, it is unlikely they will be familiar with the end point method and how to proceed. Therefore, it is necessary for the end points team to familiarize the engineers with what has to be done. The following approach is suggested:

- Conduct a training session on the end points purpose, methods, and priorities for all engineers who will prepare end point specifications and work plans.
- Ask the Engineering Manager to have one of the senior engineers participate in creating the work plan template.
- Using the work plan template as a walkdown guide, walk down his or her areas of responsibility with each engineer.
- Assist in preparing detailed end points for their areas of responsibility.
- Assist in preparing the work plan for their areas of responsibility.
- Conduct another review session after the first work plan is written.
- Be available for consultation at any time.

In addition, it is recommended that a separate training session for facility managers and supervisors provide an overview of the end point objectives and process.